

PORTABLE HEATER

5 BACKGROUND OF THE INVENTION

1. Field of the Invention

The present invention relates to portable heating devices.

10 2. Brief Description of the Prior Art

As home heating oil and natural gas prices fluctuate upward, there is an increasing need for efficient, inexpensive portable heaters. Portable heaters provide flexibility to enhance the comfort of specific rooms within a centrally-heated home, without incurring the cost of employing the central furnace to heat the entire home, including unoccupied rooms.

Portable heaters are well known in the art. One well-known type of portable heater is the portable radiator-type heater. Examples of portable radiator-type heaters are disclosed in U.S. Patents 4,493,974, 4,870,253, 5,966,498, and D 341,654.

Portable radiator heaters typically include a set of flattened, tubular radiator units filled with a diathermal fluid such as mineral oil. The radiator units are joined proximate their tops by an upper header and proximate their bottoms by a lower headers. The headers permit the thermal fluid to flow between radiator units. An electric heating element is provided in the lower header. The heating element serves to warm the diathermal fluid so that the fluid circulates through the radiator units by thermal convection, to warm the air adjacent to the exterior surfaces of the tubular radiator units.

U.S. Patent 4,879,253 discloses a portable radiator-type heater equipped with an air-circulating fan under the radiator units. The fan optionally includes resistive heating elements for preheating air expelled by the fan. The orientation of the exhaust of the fan can be varied from a generally vertical position in which the fan exhaust is directed upward through the radiator units, to a generally horizontal position in which the exhaust is directed outward away from the radiator units.

The greater the number of radiator units, the greater their collective surface area, the greater the rate of heat transfer from the radiator unit to the surrounding air. Thus, it is desirable to employ as many radiator units as practical. On the

other hand, each additional radiator unit adds to the cost of manufacturing the portable heater. Thus, there is a need for a portable radiator-type heater that employs a reduced number of radiator units, yet provides effective heat transfer from the radiator units to the room air.

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SUMMARY OF THE INVENTION

The present invention provides a portable heater comprising a sealed radiator containing a diathermal fluid. The radiator includes a plurality of tubular radiator units. Each of the tubular radiator units has respective upper portions and respective lower portions. The portable heater further includes at least one electric heating element positioned within the sealed radiator, as well as a fan positioned above the sealed radiator for directing air on the upper portions of the tubular radiator units. The fan is effective to cool the upper portions of the tubular units. This enhances thermal convection of the diathermal fluid within the tubular radiator units.

The present invention thus advantageously reduces the surface area required for transferring heat from the electric heating element via the diathermal fluid to the room air. Thus, at least one fewer tubular radiator unit is required, with a concomitant reduction in the cost of manufacturing the portable heater. In addition, the radiator can be maintained at a cooler temperature. It has been calculated that for every 10 degrees Celsius that the operating temperature can be reduced, the power consumption per tubular radiator unit can be concomitantly reduced by 250 watts. Thus, the power consumption of the portable heater can be advantageously reduced. Further, the present invention provides more rapid heat distribution from the portable heater to the room.

Preferably, the heater includes a centrifugal fan driven by an electric motor. It is also preferred that a quiet fan be employed. To that end, it is preferred that the electric motor operates at low rpm, preferably at less than 2500 rpm, and more preferably at less than 1000 rpm. Preferably, the portable heater includes a cover enclosing the fan.

BRIEF DESCRIPTION OF THE DRAWING

Figure 1 is a perspective view of a portable heater according to the present invention.

Figure 2 is a side elevational view of the heater of Figure 1.

Figure 3 is a top plan view of the heater of Figure 1.

Figure 4 is a front elevational view of the heater of Figure 1.

Figure 5 is an exploded perspective view of the heater of Figure 1, showing
5 assembly of the heater and the major components thereof.

DETAILED DESCRIPTION

Referring now to the figure in which like reference numerals represent like
10 element in each of the several views, there is shown in Fig. 1 a portable heater 10
of the present invention. As can be seen in the exploded view of Fig. 5, the
portable heater 10 includes a central radiator 20 formed from a plurality of
generally flat, tubular radiator units 22 formed from a suitable material such as
sheet metal.

15 Proximate the top of each of the radiator units 22 and symmetrically
extending outwardly of each side thereof there are formed a pair of upper header
elements 23, each in the form of a truncated cone. Similarly, proximate the bottom
of each of the radiator units 10 and symmetrically extending outwardly from each
side thereof there are formed a pair of lower header elements 25, each in the form
20 of a truncated cone.

When the radiator 20 is assembled, each of the upper header elements 23
are collinear, thus forming an upper header section 24, and providing a flow path
for fluid in between the interiors of the tubular radiator units 22, the exterior-facing
upper header elements of the first and last radiator units 22 being sealed.
25 Similarly, when the radiator 20 is assembled, each of the lower header elements
25 are collinear, thus forming a lower header section 26, and providing a flow path
for fluid in between the interiors of the tubular radiator units 22. The portion of the
radiator 20 proximate the top of the radiator 20 can be referred to as the upper
portion 28 and the portion of the radiator 20 proximate the bottom of the radiator 20
30 can be referred to as the lower portion 30.

An electrical resistance-heating element 40 is positioned inside the radiator
20 within the lower header section 26. The radiator 20 is filled with a diathermal
fluid such as an inert oil, for example, mineral oil, for transferring heat from the
electrical resistance heating element 40 to the exterior surfaces of the radiator
35 units 22. The interior of the radiator 20 is sealed against leakage of the diathermal
fluid.

A wiring harness 32 connects the heating element 40 with a source of external electrical power via a power cord 34 and with various electric control devices. A thermostat 42 controls operation of the electrical resistance-heating element 40. A thermal fuse 44 is also provided positioned proximate the radiator 20 as a safety device against overheating of the radiator 20. In addition, a tip-over switch 46 is provided to cut off current to the heating element 40 should the portable heater 10 be accidentally tipped over. A temperature limiter 48 is also provided as a safety measure. A power switch 50 is provided to control overall operation of the portable heater 10.

A fan 52 is provided proximate the top of the radiator 20. The fan 52 includes a generally cylindrical housing 56 with a downwardly directed outlet for blowing air over the upper portion 28 of the radiator 20. The fan also includes a generally cylindrical "squirrel cage"-type fan blade assembly 54, supported at one end by a suitable bearing 62. The fan 52 includes a motor 62 that drives the fan blade assembly 54 through a suitable drive 58. A baffle plate 64 is provided in between the fan housing 56 and the fan motor 62. The fan motor 62 is mounted above an insulation plate 66 for thermally insulating the fan motor 62 from the radiator 20. Preferably, the fan motor 62 is of a low rpm type, preferably having an operating speed of less than 2500 rpm and more preferably less than 1500 rpm, so that the fan 52 operates quietly.

The portable heater 10 also includes a front cover 68 (Fig. 4) and a rear cover 74 (best seen in Fig. 5) each formed from a suitable material, such as by molding a suitable heat-resistant thermoplastic material. The front cover 68 is adapted to receive a control panel 70 proximate the top of the front cover 68, the control panel 70 having a plurality of apertures formed therein for receiving knobs 92 for controlling the power switch 50 and the thermostat 42, as well a pilot lamp 94 for indicating operation of the portable heater 10. The control panel 70 also includes a molded-in handle 72, and the rear cover 74 includes an aperture for receiving a corresponding handle 76, to permit the portable heater 10 to be moved. The front panel 68 is also adapted to receive a cord wrap plate 96 proximate the bottom of the front panel for wrapping the electrical power cord 34. A pair of wheel units 96 fitted with suitable wheels or castors is provided under the radiator 20 to facilitate moving the portable heater 10. In addition, a generally "U"-shaped top cover 80 (Figs. 2 and 3) is provided for covering the upper portion 28 of the radiator 28 and enclosing the fan 52. The top cover 80 is provided with a plurality of louvers 82 adapted to cool the top cover 80 and to permit air to draw into the

fan enclosure. The front cover 68 and the rear cover 74 are also provided with a plurality of louvers 78 to permit air circulation and cooling.

- 5 It will be recognized by those skilled in the art that changes may be made in the above described embodiment of the invention without departing from the broad inventive concepts thereof. It is understood, therefore, that this invention is not limited to the particular embodiments disclosed, but is intended to cover all modifications, which are within the scope and spirit of the invention.

68 74 78 80 82 84 86 88 90 92 94 96 98 100 102 104 106 108 110 112 114 116 118 120 122 124 126 128 130 132 134 136 138 140 142 144 146 148 150 152 154 156 158 160 162 164 166 168 170 172 174 176 178 180 182 184 186 188 190 192 194 196 198 200 202 204 206 208 210 212 214 216 218 220 222 224 226 228 230 232 234 236 238 240 242 244 246 248 250 252 254 256 258 260 262 264 266 268 270 272 274 276 278 280 282 284 286 288 290 292 294 296 298 300 302 304 306 308 310 312 314 316 318 320 322 324 326 328 330 332 334 336 338 340 342 344 346 348 350 352 354 356 358 360 362 364 366 368 370 372 374 376 378 380 382 384 386 388 390 392 394 396 398 400 402 404 406 408 410 412 414 416 418 420 422 424 426 428 430 432 434 436 438 440 442 444 446 448 450 452 454 456 458 460 462 464 466 468 470 472 474 476 478 480 482 484 486 488 490 492 494 496 498 500 502 504 506 508 510 512 514 516 518 520 522 524 526 528 530 532 534 536 538 540 542 544 546 548 550 552 554 556 558 560 562 564 566 568 570 572 574 576 578 580 582 584 586 588 590 592 594 596 598 600 602 604 606 608 610 612 614 616 618 620 622 624 626 628 630 632 634 636 638 640 642 644 646 648 650 652 654 656 658 660 662 664 666 668 670 672 674 676 678 680 682 684 686 688 690 692 694 696 698 700 702 704 706 708 710 712 714 716 718 720 722 724 726 728 730 732 734 736 738 740 742 744 746 748 750 752 754 756 758 760 762 764 766 768 770 772 774 776 778 780 782 784 786 788 790 792 794 796 798 800 802 804 806 808 810 812 814 816 818 820 822 824 826 828 830 832 834 836 838 840 842 844 846 848 850 852 854 856 858 860 862 864 866 868 870 872 874 876 878 880 882 884 886 888 890 892 894 896 898 900 902 904 906 908 910 912 914 916 918 920 922 924 926 928 930 932 934 936 938 940 942 944 946 948 950 952 954 956 958 960 962 964 966 968 970 972 974 976 978 980 982 984 986 988 990 992 994 996 998 1000